

Effective models of staff development in ICT

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Previous studies into teacher attitude and motivation have identified staff development as one of the contributing factors in using ICT effectively in the classroom. Substantial funds have been provided for such staff development in recent years in the UK. Currently, ICT training is being funded to a level of £23m in Scotland and £230m in England and Wales over the period 2000–2003. This paper will report on an investigation into effective staff development in ICT for teachers. A sample of Scottish primary school teachers have been surveyed to investigate the impact of different models of staff development in ICT on the teacher and to explore the knowledge and skills gained by teachers from staff development: technical; academic/content-related; pedagogy. The results indicate the need for a much greater emphasis to be placed on the pedagogy of ICT. This should be of interest to all involved in teacher education and the continuing professional development of teachers.

Des recherches antérieures dans les attitudes et la motivation des écoles et du secondaire ont montré que la formation du corps enseignant est un des facteurs les plus importants dans l'utilisation de l'outil informatique de manière efficace en classe. Des sommes conséquentes ont été allouées pour cette formation dans les dernières années au Royaume Uni. En ce moment la formation à l'outil informatique ainsi dispensé le chiffre à £23 millions en Ecosse et £230 millions en Angleterre et au Pays de Galles pour la période 2000–2003. Ce rapport va rendre compte des recherches dans la formation en informatique et de son efficacité pour le corps enseignant. Un sondage auprès des professeurs des écoles en Ecosse a été réalisé dans le but d'enquêter sur les effets des différentes approches de la formation es professeurs du primaire et aussi d'explorer les connaissances et les compétences obtenues par les instituteurs à l'issue de la formation dans les domaines; techniques; académiques; pédagogiques. Les résultats montrent qu'il est nécessaire mettre l'accent sur la pédagogie de l'informatique. Ceci doit intéresser tous ceux qui prennent part dans la formation initiale et continue des maîtres.

Es war durch vorgehende Forschungen über die Geisteshaltung und Motivierung der Lehrers gewiesen, dass die Ausbildung sehr wichtig für das Benützen der Informatik in der Klasse war. Man hat grössere Gelder für solche Ausbildung in Grossbritannien gefunden. Zurzeit die informatische Ausbildung wird in Schottland zu £23 Millionen finanziert; und zu £230 Millionen in England und Wales finanziert. Dieses Referat wird über effektive Ausbildung für Lehrern von Informatik berichten. Eine Untersuchung der schottischen Lehrern in Grundschule war gemacht, um die Wirkung von verschiedenen Sorten Ausbildung auf den Lehrern zu finden und um die Kenntnisse und die Fähigkeiten den Lehrern nach der Ausbildung; teknische; akademische; pedagogische; zu studieren. Die Ergebnisse zeigen, dass man die Pedagogik der Informatik betonen soll. Das soll interessant für alle, die beteiligt an die Ausbildung von Lehrern sein.

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ICT in the classroom: the context and the role of staff development

Introduction

This paper focuses on the area of information and communications technology (ICT) in the school sector and particularly on staff development. The use of ICT to support and enhance the teaching and learning of school pupils is a key component of government education policy.

This research will explore and investigate the effectiveness of staff development in ICT for teachers. The effective use of ICT in pupil learning is dependent on the teachers being able to understand the pedagogy of using ICT as a learning tool. There is tremendous potential for innovative and creative learning to take place in the classroom, but the teacher must be fully competent and confident in the pedagogy of using ICT. Thus, staff development is essential for those teachers.

There has been a limited amount of useful study in this field. This study will be based on classroom practitioners and will also draw upon an existing European project for some of its evidence.

Context

The economic competitiveness of the UK is dependent on an educated population and workforce. One of the key components in the government's education policy is the use of ICT to support and enhance the teaching and learning of school pupils; this will enable these pupils to become technically competent, confident and literate in the use of such technologies. This should ensure that these young people are fully equipped to embrace the world of employment and opportunity which will increasingly make highly skilled technological demands of its workforce. Investing in the development of teachers will have a multiplier effect in terms of pupil learning and economic competitiveness. Where citizenship is to be embraced in this culture is not yet clear.

There is now widespread use of ICT in society in general, with everyday use in the home a common feature. The government's intention is to provide access for all to ICT, to the Internet, e-learning, etc. Increasingly, leisure use of ICT forms a major part of its use in the home. However, does use in the home indicate a level of competence and confidence that can be built upon in the classroom? What skills can teachers develop from their personal use of computers in the home? Does ICT assist teachers in their work?

Developments outlined in documents and initiatives such as *Connecting the learning society* (Department for Education and Employment, 1997a), the *National Grid for Learning* (NGfL), *Targeting excellence—modernising Scotland's schools* (The Scottish Office, 1999), *Excellence in schools* (Department for Education and Employment, 1997b) and *Setting targets—raising standards in schools* (Scottish Office for Education and Industry, 1998) are being funded to a substantial level by the government and are impacting on many facets of public services and policies. The NGfL is developing as a massive source of learning materials which will be available from a computer based in a school, library, community centre, university, college, workplace, home, etc. Government policy is firmly based on the information society and e-learning

being available to the whole population, which will require training and development for all within our society. Funding for such training is being provided through the New Opportunities Fund (NOF); this training is targeted at teachers and librarians and is intended to focus on applications of ICT in the classroom rather than the technical skills of using ICT. However, there are issues in terms of the timescale for training, the appropriateness of the training, the self-directing nature of the training and the level of prerequisite knowledge and skills. Delays in the upgrading of equipment in schools have also contributed to some of the concerns being expressed about the training.

Literature review

Staff development in ICT, teachers' attitudes and curricular change

Experience of working with teachers over a period of years in both the initial teacher education (ITE) and continuing professional development (CPD) fields would suggest a number of issues for discussion. Teachers have experienced severe pressure in recent years as a result of imposed external influences: ongoing curriculum innovation, innovation overload, professional denigration by politicians and media, deteriorating conditions of service.

In considering the use of ICT in the classroom, Cox *et al.* (1999a) identified a number of external factors that will influence how teachers approach this change:

- the requirements of a national curriculum or guidelines;
- ICT requirements for new teachers;
- NOF training for teachers;
- changes in society with the rapid growth in ICT use;
- school policies on ICT;
- opinions of colleagues and peer pressure;
- responsibilities of the teacher;
- pressure from parents and pupils;
- influence and policies of the education authority.

Hoffman (1996) identified eight factors that would contribute to successful integration of ICT in the curriculum. These can be broadly defined under three headings: (1) personnel, (2) technical and (3) resources.

A major factor under 'personnel' was the existence of appropriate and relevant staff development. Interestingly, another major factor was the requirement for adequate technical support for teachers, but that is not an issue for this paper. Further research by Lawson and Comber (1999) into teachers' reactions to ICT identified a number of important factors which could lead to a positive or negative response to the introduction of ICT. These were:

- teachers' attitudes prior to the innovation;
- the role of the ICT coordinator (in the school);
- the attitude of senior management;
- the existence of appropriate support and training.

These studies clearly highlight the importance of staff development in the process of using ICT in the curriculum. The results of these studies should be given consideration by teachers when reviewing their professional role and in considering their staff development requirements, noting that a key factor is appropriate and relevant training for teachers.

However, staff development is not the only factor which will have an influence on teachers and their motivation and attitude to using ICT. Cox *et al.* (1999a) proposed that there are a range of positive and negative factors that will influence how teachers perceive the ease of use of ICT and how they perceive its usefulness. These factors were very detailed in terms of considering teachers' motivation, but staff development was not included as a factor; thus, do we know if staff development in ICT has an influence on teachers' attitudes to using ICT in the classroom? I would suggest that we need to investigate this issue in detail in order to determine its influence, if any.

The previous studies into teacher attitude and motivation have identified staff development as one of the contributing factors. However, staff development, and its nature, has not been studied on its own with regard to teacher attitude and behaviour. This is despite substantial funds being provided for such staff development in recent years. Currently, the NOF training is being funded to a level of £23m in Scotland and £230m in England and Wales over the period 2000–2003. Thus, given such investment and the significant nature of the change process of integrating ICT into the curriculum, further study is required in order that staff development in ICT may be better understood and supported.

The nature of staff development in ICT

Cox *et al.* (1999b) have indicated that ICT can be a highly motivating feature for teachers. Their research findings indicated that teachers thought the following:

- ICT made lessons more interesting;
- using ICT was more enjoyable;
- using ICT would enhance career prospects.

However, teachers expressed their concerns about their perceived ability to use ICT and difficulties experienced in using ICT. Lawson and Comber (1999) also refer to teachers' attitudes and note that pre-existing attitudes can hinder the adoption of ICT. They also refer to a key point that a teacher who has a valuable and worthwhile exposure to ICT for direct teaching purposes is likely to gain confidence in using ICT as a result; the teacher is then more likely to make use of ICT in learning and teaching and also to take a different attitude to such developments.

Previous studies and professional experience has shown that until recent times much staff development in ICT has concentrated on the technical and skills use of ICT rather than the pedagogic use. Teachers may attend a course and learn how to word process or 'surf the net' or develop web pages, but these skills must be placed in a pedagogic context and teachers must be shown how to refocus their work and lessons to take account of ICT. This pedagogic context should enable teachers to

understand how to use ICT in the classroom, to consider how ICT can support and enhance pupil learning as a natural part of the work in the classroom, to consider how ICT can provide more learning opportunities and be another vital learning tool for pupils. When the teacher is using ICT in the classroom, he or she will be teaching about ICT in an implicit manner and will be developing pupils' practical skills, but it will also be about creating enhanced learning contexts and challenges for pupils in many curricular areas: this is the crucial challenge that faces the teacher and for which they need support and staff development.

Cox *et al.* (1999b) have indicated that longer in-service courses are more effective compared to the short one day style of course. Professional experience would support this unsurprising finding, as informal discussion and consultation with teachers has indicated that the short one day course often does not provide sufficient opportunity for breadth and depth of study. Of course, there are a range of different models of staff development and these will be discussed further at a later stage in this paper. However, it is worth noting that it is not being suggested that longer in-service courses are the only way forward for staff development. It is more important to note that a range of staff development models will be required and that effective strategies will need to be developed to support these models.

There has been a history of ineffective strategies being used to support staff development in ICT. A typical example of an ineffective strategy was the use of the 'cascade' model for CPD. This was mainly used for short one day or evening courses but proved to be unsuitable. The quality of the 'cascade' depended centrally on those who had been trained in the first phase, however, these staff were not necessarily good teacher educators or trainers and the quality of courses offered by such staff was extremely variable. Thus, staff attending courses led by the 'trained cascaders' very often gained little or no benefit from the investment of time and money in staff development.

A further example of ineffective strategy relates to the manner in which teachers are selected for in-service courses and their perception of such courses. The perceived needs of teachers and their actual needs can be seriously mismatched: teachers may select, or be selected for, a course which they believe has certain outcomes; on attending the course they discover that it is not the most suitable for them and does not meet their needs. This has been a problem in the area of ICT as many education authorities and schools have reacted to the need for staff development without fully taking account of the purposes of the in-service offered and the actual needs of their teachers. Unfortunately, teachers who have experienced poor quality in-service as indicated by these two examples then find this to be extremely demotivating, which can lead to apathy or a resistance to change.

Kirkman (2000) has analysed the effective management of ICT in schools via six case studies. Although concentrating on management issues, he also identifies a development cycle for ICT for teachers. This cycle involves gaining experience, evaluating, changing their attitude and then modifying or refining the use of ICT. It is also proposed that there must be a methodical development of teachers in terms of their use of ICT, with staff development playing a key part. However, it is suggested that staff development should be targeted at pupil tasks in order to have

a direct relevance to the classroom for the teachers. There is some concern that such an approach can be too limiting for teachers, and while it can have immediate benefits in the classroom, it might not necessarily support longer term aspirations of integrating ICT fully into the curriculum. Further, such an approach may also be regarded as simply providing 'classroom tips for teachers' and not giving full consideration to professional and pedagogic issues.

Kirkman (2000) further identifies a range of important factors which will promote effective ICT development. It is worth noting that adequate staff development, resource development and the introduction of new pedagogies are highlighted within the range. This is consistent with the evidence presented above.

Davis (1999) has proposed that there are three interacting principles underpinning ICT in teacher education. These are pedagogic considerations, technical considerations and networking and collaboration considerations. This is consistent with experience that suggests that teachers should not be trained in a manner which suggests that they are classroom technicians, but in a way which respects and builds upon their professionalism. Teachers also have to be encouraged to take responsibility for their own learning and investigation as part of their professionalism.

A study of the ICT development needs of teachers by Williams *et al.* (2000, pp. 170 and 180) found that these could be broadly categorized into three major areas:

- access to ICT;
- appropriate training;
- ongoing support.

The training (or staff development) priorities for ICT development were consistently expressed across primary and secondary teachers as classroom practice, professional development, personal use and administration. The needs were expressed very widely, but could be classified into four skills and knowledge categories: technical skills and knowledge; application and pedagogic use; management skills and knowledge; teaching ICT skills. Finally, when asked to list the characteristics of useful training, the following were identified:

- appropriate to classroom use;
- has a hands-on practical element;
- provides on-the-spot help;
- provides opportunities to work and share with other teachers.

Staff development for teachers will include a diverse range of operational models, such as one day in-service courses, five day in-service courses, online support, in-school activity, school-based, local authority centre-based, 'twilight' or evening in-service modules, postgraduate activity, peer support, etc. This list is not exhaustive and merely illustrates the diverse nature of the models of staff development. However, Bredeson (2000, p. 70) argues that new approaches are required for teacher development and that the traditional model of 'one size fits all' no longer applies. He states that staff development and teacher learning needs to be

reconceptualized as 'work' and 'at work' and that staff development must be regarded as important work that directly relates to teachers' work with pupils.

The evidence presented above clearly highlights the need for effective and relevant staff development in ICT, with consideration being given to the nature, type and form of staff development required. Thus, there is a clear need for further research into this important area, in order to identify the most effective types of staff development in ICT. This leads to the following research question:

What is the teachers' view of the most effective type of staff development in ICT in terms of impact on teachers?

Research methods

The research question will lend itself to a positivist approach because of the potential for more quantitative analysis. The factors are the forms of staff development, the outcome is the impact on teachers and the population is teachers who have experienced staff development in ICT.

Developments in ICT are occurring in both the primary and secondary sectors, so the nature of the population needs to be carefully considered. The population of teachers cannot be surveyed as a whole, but a representative sample can be. Data that might be required from teacher respondents would include the sector taught, age, gender, qualification (whether undergraduate or postgraduate qualified), number of years teaching and post (also, whether he/she has any responsibility for ICT). Primary teachers in Scotland qualify with either an undergraduate or postgraduate teaching qualification which is designed to enable them to teach all areas of the curriculum to pupils aged from 3 to 12 years. This is different from many other countries, including England, where there can either be broad subject specialisms or specific stage (age-related) specialisms. Thus, a survey involving Scottish primary teachers will not have the complications or complexities of dealing with further sub-divisions or sub-domains.

A sample of primary teachers who had undertaken staff development in ICT were requested to complete a questionnaire. Given the number of primary schools in Scotland (approximately 2200), a 2% sample involved 40 schools, and one teacher per school was asked to complete the questionnaire.

The research instrument is a questionnaire on the effectiveness of different types and models of staff development in ICT. The models of staff development are extremely varied, as noted before. This will mean that the questionnaire will need to allow respondents to consider many different models of staff development; this will include such as school-based, local authority centre-based, one day in-service, 'twilight' or evening in-service, five day in-service modules, postgraduate activity, peer support, etc. The questionnaire should provide sufficient options to cover as many models of staff development as possible and enable respondents to complete the form in a straightforward manner. The data gathered should provide an insight into teachers' perceptions of effective staff development in ICT.

As well as exploring the models of staff development experienced in ICT, the questionnaire should also investigate the quality of that staff development and the

Table 1.

Years of experience	Percentage	Post of responsibility
0-5	11%	0%
6-10	16%	31%
11-15	21%	49%
16-20	28%	37%
20 +	24%	44%

impact on the teacher. It will be worthwhile exploring the type of knowledge gained by teachers from staff development. ICT knowledge can be classified in three ways: technical skills (such as developing word processing skills); academic or content-related (which could be viewed as knowledge and understanding, an example being understanding what a database is and when it can be used); pedagogy (how to use ICT to promote pupil learning). It would be worthwhile trying to identify teachers' perceptions of the nature of the knowledge developed.

Results

The data from the survey was analysed using SPSS to carry out a number of statistical tests. The results are presented in this paper under three main categories: experience and qualifications of the teachers; their perception of effective models of staff development; the skills and knowledge developed in the staff development undertaken.

Experience and qualifications

The majority of the teachers all had reasonable classroom experience and would be regarded as experienced practitioners. The vast majority had taught for at least 5 years, with a number having taught for over 20 years. A substantial percentage had taken up a post of responsibility of some type, with some being responsible for ICT coordination within their school. These results are shown in Table 1.

This indicates that a high percentage of those teachers who have undertaken staff development in ICT have progressed to holding a post of responsibility within their school and will be regarded as practitioners with credibility in the eyes of their peers.

Models of staff development

The survey asked teachers to indicate the effectiveness of different models of staff development in ICT, based on their experience of undertaking staff development over a period of years. It was specifically targeted at ICT activities and did not consider the general issue of models of staff development. Staff development activities in ICT were classified into a number of different models and the teachers

Table 2.

Model of staff development	Rating		
	Highly effective	Satisfactory	Least effective
Short in-service course	67%	22%	11%
Long in-service course	23%	62%	15%
Own time course	9%	27%	64%
School-based activity	28%	34%	38%
Outside school activity	44%	31%	25%
Online learning	6%	27%	67%
Distance learning	16%	32%	52%
Peer support	11%	68%	21%

were asked to indicate which models they perceived as having had a positive impact on their approach to ICT in the classroom.

The analysis of the data displayed some interesting facts regarding teachers' perceptions of effective staff development:

- traditional in-service courses which gave face-to-face contact with a tutor were highly effective;
- longer, in-depth courses of 5 days were reasonably effective;
- courses undertaken at the end of the school day, in the evening or weekend (in the teacher's own time) were not effective;
- courses based outside the school were more effective than those based within it;
- on-line support was not effective;
- peer support was only rated as being satisfactory.

A summary of the results is shown in Table 2. They indicate that teachers have the perception of 'traditional' in-service courses being more effective in enabling them to use ICT.

Skills and knowledge

The survey asked the teachers to classify the skills and knowledge that had been developed in the staff development undertaken: technical; academic; pedagogical. They were also asked which type had a positive impact on their approach to ICT in the classroom. The results are shown in Table 3.

Table 3.

Skills and knowledge	Percentage
Technical	35%
Academic	44%
Pedagogic	21%

Table 4.

Skills and knowledge	Rating		
	Highly effective	Satisfactory	Least effective
Technical	12%	26%	62%
Academic	14%	33%	55%
Pedagogic	47%	37%	16%

The impact of each is shown in Table 4.

This evidence clearly shows that staff development based on pedagogy has had far greater impact on teachers' use of ICT than any other type. Further, it indicates that there has been a great emphasis placed on technical and academic staff development and insufficient on pedagogy.

Conclusions

The survey drew upon a range of classroom practitioners with significant experience. These were also teachers who were willing to use ICT in the classroom. They also had sufficient experience of teaching and staff development to allow their views to be valued and listened to.

The results on the models of staff development indicate that teachers still value in-service courses which provide direct contact with a tutor. This supports the views expressed in Williams *et al.* (2000, pp. 170 and 180) regarding the practical element and on-the-spot help. Also, the results show a preference for 'courses' rather than on-line learning or distance learning, etc. Does this mean that the teachers are traditionalists or unwilling to accept new ideas? Not necessarily! Models such as on-line learning or distance learning are still at the early stages in many places and the teachers' perception is that these models have had least impact on them. Also, traditionalist teachers do not undertake development in ICT! Significantly, the teachers also have the perception that working outside the school environment is beneficial, but not working in their own time. Teachers usually benefit from staff development activities that occur outside the school because it takes them away from their own localized environment and allows them to meet peers on 'new territory' and to engage in professional dialogue and discourse. Thus, staff development must be offered in such a way as to be meaningful to teachers and perceived as having value.

The next key issue is the concentration on skills and content development to the detriment of pedagogy. It would be agreed that staff development is essential in terms of equipping the current teacher workforce with the knowledge, attitudes and skills to use ICT in an effective manner in the classroom. However, much previous staff development has concentrated on either the technical skills or a background knowledge of ICT rather than the pedagogic use. Such developments are unsatisfactory in terms of impact on teachers' use of ICT in the classroom. The worrying matter is that the majority of staff development has been of this nature.

Staff development of a pedagogical nature has been most effective, but has been insufficient. Teachers may attend a course and learn such as how to word process or 'surf the net' or develop web pages, but these skills must be placed in a pedagogic context and teachers must be shown how to re-focus their work and lessons to take account of ICT. This pedagogic context should enable teachers to understand how to use ICT in the classroom, to consider how ICT can support and enhance pupil learning as a natural part of the work in the classroom, to consider how ICT can provide more learning opportunities and can be another vital learning tool for pupils. A teacher who has a valuable and worthwhile exposure to ICT for direct teaching purposes is likely to gain confidence in using ICT as a result; the teacher is then more likely to make use of ICT in learning and teaching and also to take a different attitude to such developments. Can we be assured that the next stage in ICT training will focus on the pedagogy of ICT?

It is essential that the pedagogy of ICT becomes the main focus of staff development and this will have to be built upon in a constructive manner in order to allow teachers to achieve the full benefits of using ICT in the classroom.

Notes on contributor

John McCarney was appointed Vice Principal of St Andrew's College of Education in 1996. Following the merger of St Andrew's College with Glasgow University in 1999, he became Associate Dean until July 2001. In May 2003, John was appointed to East Ayrshire Council, with responsibility for primary and secondary schools, staffing and staff development. He has significant consultancy experience at national and international level. At national level, he has been involved in initiatives and developments in both the field of initial teacher education and ICT, working with such agencies as the Scottish Executive Education Department, the General Teaching Council for Scotland, the Quality Assurance Agency, education authorities and the National Grid for Learning (NGfL). At international level, John was the coordinator for two EU-funded projects in the Czech Republic and Estonia (1992–1997); these projects involved the design and development of in-service postgraduate courses in ICT for teachers in these countries. John was the coordinator for an EU-funded project entitled Titania; four countries—Austria, Denmark, Scotland and Slovenia—participated in developing case studies and in-service courses on good practice in using ICT. He is now working on an EU project investigating good practice in mentoring. John has been an active member of the Association of Teacher Education in Europe and its Research and Development Committee on Inservice Teacher Education since 1996. This has involved regular presentations at international conferences and at invitation seminars held in member countries.

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